

## **Perchlorate Fact Sheet**

### **What is Perchlorate?**

Ammonium perchlorate ( $\text{NH}_4\text{ClO}_4$ ) is an inorganic chemical widely used as an oxidizer in solid propellants for rockets, missiles, fireworks and explosives. Perchlorate may thus be found in surface and ground waters around military operations, defense contracting, manufacturing facilities, and areas where blasting agents have been used. Perchlorate may also be generated in small amounts within existing water treatment processes. Perchlorate has also been found at low levels in some groundwaters where no anthropogenic source is apparent. Perchlorate is highly mobile in water and can persist for many decades under typical ground and surface water conditions.

### **How Might I be Exposed to Perchlorate?**

Human exposure to perchlorate can occur if contaminated water is consumed directly, is used to make beverages such as tea, coffee or formula, or is used to cook foods that absorb a significant amount of water. Perchlorate has also been detected in several types of foods (e.g. some lettuces and milk, depending on where they are from), possibly from use of perchlorate contaminated irrigation water or feeds. Infants can be exposed to perchlorate through breast milk, depending on their mother's exposure. Absorption of perchlorate as a result of skin contact during showering and bathing is not a concern because perchlorate is completely ionized in water. However, children may be incidentally exposed by ingesting water during bathing. Showering only becomes of concern when perchlorate concentrations in water reach many hundreds of parts per billion, due to the inhalation of aerosolized particles in the air.

### **What Are The Health Effects Of Perchlorate?**

Perchlorate disrupts normal function of the thyroid gland. It interferes with iodide transport into the thyroid gland, decreasing the availability of iodide needed for the synthesis of thyroid hormones, which are essential for metabolism and normal growth and development. The impacts of disrupting thyroid hormone synthesis are greatest on pregnant women and their developing fetuses, infants, children, and individuals who have low levels of thyroid hormones.

Adverse health effects associated with perchlorate exposure are expected to be similar to those caused by iodine deficiency in humans. In areas of inadequate iodine intake, thyroid hormone synthesis and secretion decline, and the effects manifested in such iodine-deficient individuals, depending on the severity of the iodine deficiency, include: impairment in physical development, behavior, movement, speech, hearing, vision, and intelligence. Other effects of iodine deficiency also include signs and symptoms of hypothyroidism and enlargement of the thyroid gland. Impaired brain development and

lower IQ were observed in children born to even mildly or moderately iodine deficient mothers.

## **Why Did MassDEP Choose To Address Perchlorate Risk?**

In April 2002, the Bourne Water District (BWD) asked MassDEP for guidance on perchlorate, after the compound was detected in their wells. To date, no drinking water standard had been set by either the U.S. Environmental Protection Agency (USEPA) or the state. Given the seriousness of the potential adverse effects associated with perchlorate and the fact that children were at risk, combined with uncertainty over the schedule of federal efforts to establish a drinking water standard for perchlorate, MassDEP provided interim guidance to the BWD and initiated the standard setting process.

## **Why Is It Necessary For MassDEP To Set Perchlorate Standards?**

MassDEP is establishing perchlorate standards to ensure that public health is protected and to facilitate the cleanup of perchlorate sources.

## **What Perchlorate Standards Are Being Set By MassDEP?**

MassDEP is proposing a drinking water standard or Maximum Contaminant Level (MCL) and hazardous waste site cleanup standards for perchlorate under the Massachusetts Contingency Plan or MCP (MGL Chapter 21E). In addition, MassDEP is proposing a reference dose (RfD) of  $7 \times 10^{-5}$  mg/kg-day to be used for site-specific risk assessments.

## **What Is MassDEP Currently Recommending Regarding Perchlorate In Drinking Water?**

MassDEP is proposing a perchlorate drinking water limit, or MCL, of 2 ppb. This is one of the first proposed drinking water standards for perchlorate in the nation.

## **What is the Basis of MassDEP's Perchlorate Standards?**

MassDEP's perchlorate MCL proposal is the outcome of the application of a risk management strategy. The strategy first considered the health risks of perchlorate using a thorough analysis of perchlorate's toxicity by MassDEP toxicologists. Other factors taken into account in selecting the final drinking water standard included the scope of the problem; the availability and feasibility of testing and treatment technologies; and data that demonstrated that perchlorate can be introduced into drinking water when certain disinfection chemicals are used.

Statewide occurrence monitoring conducted in 2004, using then newly improved analytical techniques, identified relatively few contaminated water supplies, suggesting a manageable aggregate cost for clean-ups. Treatment technologies were also being proven capable of removing perchlorate to low levels. MassDEP's investigations into perchlorate contamination at several public water systems identified contributory effects from common disinfection treatment chemicals; other previously unknown sources of perchlorate, including blasting agents, fireworks, and wastewater discharges; and a low background level of perchlorate in some areas where a source remains to be identified. These additional potential sources of perchlorate may represent widespread routes for the introduction of perchlorate in drinking water and thus may increase costs to public water systems of complying with a state MCL for perchlorate. Of particular concern was the identification of perchlorate attributable to water supply disinfection. Disinfection of drinking water has been called one of the most important public health accomplishments of the past century. To ensure that this benefit is not compromised due to the possible introduction of perchlorate from the use of disinfection chemicals, MassDEP has chosen to set the MCL at a level that does not create any disincentive on the part of public water systems to continue or, when necessary, introduce disinfection to counter microbial contamination and associated risks to public health. The proposed MCL of 2.0 ppb provides the best overall protection of public health, considering the benefits of disinfection, while retaining a margin of safety for sensitive populations including the fetus, infants, young children, pregnant or nursing women and individuals with low levels of thyroid hormones.

## **Will DEP require all public water systems in the state to regularly test for perchlorate?**

Yes, a routine monitoring program is being proposed for all community and non-transient non-community systems. Surface waters will be monitored over four consecutive calendar quarters, groundwaters will be monitoring twice in the same period (the 2004 occurrence monitoring may be substituted for this requirement). Those systems that do not detect perchlorate will continue with annual monitoring. The option of a monitoring waiver within the existing process of the Inorganic Monitoring Waiver Program is also being proposed. The waiver considers historical monitoring results, threatening land uses and source protection measures and if granted would reduce monitoring to one sample over nine years.

## **Will There Be Opportunities For Commenting On MassDEP's Proposed Standards?**

Yes. The recommended RfD, drinking water MCL and MCP cleanup standards are now available for public review and comment. Public hearings have been scheduled at six locations across Massachusetts during the month of April and the comment period closes on May 12, 2006. MassDEP will address comments received during the regulatory comment period before adopting a final RfD and standards.

The public hearing schedule, proposed standards and documentation of the proposed reference dose are available at <http://mass.gov/dep/water/drinking/percinfo.htm>.